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Stone History and Fact Guide*

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History:

Stone is a natural solid formation of one or many minerals. There are thousands of types of stone that have been quarried through the centuries. Quarries are located all around the world. A majority of natural stone comes from Italy, Spain, Turkey, United States, Mexico, China, Taiwan, India, Greece, Canada, France, and Brazil.

The minerals in stone came from the same liquid and gas minerals that formed the earth. The Earth developed as a massive body of gas and liquid minerals that slowly cooled and condensed to a solid core. Through pressure, the Earth's crust began to form and heavy minerals were forced down to the core of the Earth where they were trapped. As the crust got thicker, it squeezed around the inner core which created intense pressure and heat from within the Earth. Crystals and other solid forms began to grow from the mineral vapors that were being released. As the Earth's crust began to expand and erode, heat and pressure pushed the solid minerals up to the Earth's surface which formed colossal rock beds. It took up to one-hundred million years to form some of these beds. Many of the beds are now used as quarries where the stone is mined.

Most of these minerals can be identified by their color, hardness, and crystal formation. Crystals come in a variety of shapes and sizes. The wide array of these minerals are often difficult to identify. Many stones look very similar to each other; however, they are all very different.

It is imperative to know the exact type of stone that is to be maintained. Stone is natural and may have adverse reactions to certain cleaning chemicals and procedures. Most stones are also natural alkalis and so are dirt and soil; therefore, stone and dirt are attracted to each other which often makes cleaning very difficult. This makes the proper selection of cleaning procedures and chemicals for stone very complex.

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Types of Stone:

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The familiar stone types that are used today are identified through four categories: SEDIMENTARY, METAMORPHIC, IGNEOUS STONE, and MAN-MADE.

- I. **SEDIMENTARY** stone came from organic elements such as glaciers, rivers, wind, or plants. Tiny sedimentary pieces broke off from these elements and accumulated to form beds. They were bonded through millions of years of heat and pressure.

LIMESTONE: Mainly consists of calcite. It does not show much graining or crystalline structure. It has a smooth granular surface. Varies in hardness. Some dense limestones can be polished. Common colors are black, grey, white, yellow or brown. It is more likely to stain than marble. Limestone is known to contain lime from sea water.

SANDSTONE: Is a very durable formation of quartz grains (sand). Usually formed in light brown or red colors. Categorized by the most popular sandstone bonding agents such as silica, calcium, clay, and iron oxide.

SOAPSTONE: A very soft stone made of a variety of talc. It is a dense mineral that wears well and is often resistant to stains.

FOSSILSTONE: Considered a limestone that contains natural fossils such as sea shells and plants.

TRAVERTINE: Usually a cream or reddish color. It is formed through the accumulation of calcite from hot springs. It contains lots of holes that were formed from water flowing through the stone. These holes are often filled with synthetic resins or cements. Requires lots of maintenance if the holes are not filled. Classified as a limestone and a marble.

- II. **METAMORPHIC** stone originates from a natural change from one type of stone to another type through the mixture of heat, pressure, and minerals. The change may be a development of a crystalline formation, a texture change, or a color change.

MARBLE: A recrystallized limestone that formed when the limestone softened from heat and pressure and recrystallized into marble where mineral changes occurred. The main consistency is calcium and dolomite. Ranges in many colors and is usually heavily veined and shows lots of grains. Hardness rates from 2.5 to 5 on the MOH Scale.

Marble is classified into three categories: (Stone World)

1. Dolomite: If it has more than 40% magnesium carbonate.
2. Magnesian: If it has between 5% and 40% magnesium carbonate.
3. Calcite: If it has less than 5% magnesium carbonate.

SLATE: A fine grained metamorphic stone that formed from clay, sedimentary rock shale, and sometimes quartz. Very thin and can break easily. Usually black, grey, or green.

SERPENTINE: Identified by its marks which look like the skin of a serpent. Most popular colors are green and brown. Hardness rates from 2.5 to 4 on the MOH Scale. Contains serpentine minerals has lots of magnesium, and has an igneous origin. Does not always react well to recrystallization or diamond polishing.

- III. **IGNEOUS** stones are mainly formed through volcanic material such as magma. Under the Earth's surface, liquid magma cooled and solidified. Mineral gases and liquids percolated into the stone and created new crystalline formations with various colors.

GRANITE: Primarily made of Quartz (35%), Feldspar (45%) and Potassium. Usually has darker colors. Contains very little calcite, if any. Provides a heavy crystalline and granular appearance with mineral grains. It is very hard material and easier to maintain than marble. Yet, it is still porous and will stain. There are different types of granite depending on the percentage mix of quartz, mica and feldspar. Black granite is known as an Anorthosite. It contains very little quartz and feldspar and has a different composition than true granite.

- IV. **MAN-MADE** Stones are derived of unnatural mixtures such resin or cement with the stone chips.

TERRAZZO: Marble and granite chips embedded in a cement composition.

AGGLOMERATE or CONGLOMERATE: Marble chips embedded in a colored resin composition.

CULTURED or FAUX MARBLE: A mix of resins that are painted or mixed with paint to look like marble.

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Stone Names:

Currently, there are many companies around the world that use generic names to identify different types of stone. This has created a problem for the stone maintenance industry. The original names were in Italian. Usually the name consists of two parts. The first part describes the color and the second part describes the name from where the stone was quarried.

ITALIAN NAME:

Azzuro
Breccia
Dorato/D'oro
Fiore
Giallo
Negro/Nero
Perla/Perlato
Rosa
Rosso
Verde
Bianco

ENGLISH COLOR:

Blue
Broken Pieces
Gold
Flower
Yellow
Black
Pearl
Pink
Red
Green
White

Example:

Negro Marquina- Black Limestone from Marquina, Spain.

Bianco Carrara- White Marble from Carrara, Italy.

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Surface Textures:

There are many different types of stone available today. When stone is ordered, it is fabricated with a particular type of surface. There are six main types of surfaces that are selected:

Honed: Provides a flat to low sheen gloss. Different levels of gloss can be selected. This surface is very smooth, but often very porous. This texture is common in high traffic buildings. Honed floors should always be protected with Stoneguard Penetrating Seal because it has wide-open pores. Honed stone colors are not as vibrant as a polished stone.

Polished: A glossy surface that wears away with time due to heavy foot traffic and using improper maintenance procedures. This surface is very smooth and not very porous. The reflectivity of polished crystals brings out the brilliant colors and grains of natural stone. The shine comes from the natural reflection of the stone's crystals. The polish is provided by polishing bricks and polishing powders that are used during fabrication. The shine is not from a coating.

Flamed: A rough surface that is developed through intense heat. During fabrication, stone is heated up and the crystals begin to pop, thus forming a rough surface. This surface is very porous and must be treated with Stoneguard.

Tumbled: A slightly rough texture that is achieved by tumbling small pieces of marble, limestone, and sometimes granite to achieve an archaic/worn appearance. It often requires an application of Stone Color Enhancer to bring out the colors.

Sand Blasted: This surface is the result of a pressurized flow of sand and water that provides a textured surface with a matte gloss.

Sawn: A process performed by using a gang saw.

Bush Hammered: A pounding action that develops a textured surface. The degree of roughness can be selected.

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Colors:

As discussed previously, stone was formed from different types of natural minerals. Marble's consistency is calcium. Calcium carbonate is the natural source that bonds the stone. Certain minerals blended in to the calcium during formation to customize these brilliant colors. The same minerals are also color developers present in granite and other natural stones.

| <u>Stone Color:</u> | <u>Mineral:</u> |
|----------------------------|------------------------------|
| Black | Biotite, Hornblende, Carbon |
| Brown | Limonite |
| Gray | Variety of minerals |
| Green | Mica, Chloride, Silicate |
| Red | Hematite |
| White | Feldspar, Calcite, Dolomite. |
| Yellow | Limonite |

| <u>Mineral:</u> | <u>Mineral Color:</u> |
|------------------------|----------------------------------|
| Augite | Brown, Green, Black, Purple |
| Biotite | Black, Brown, Green |
| Calcite | Pearlenscent and Pale Colors |
| Dolomite | Colorless, Pink, Pale Brown |
| Feldspar | Yellow, White, Pink, Green, Grey |
| Hematite | Metallic Grey or Black |
| Hornblende | Green, Yellow, Brown, Black |
| Limonite | Black, Brown, or Yellow |
| Sulphur | Pale Gold |

Minerals have a variety of crystalline properties. A different property has a different color. For instance, Augite (listed above) has different crystalline properties. Each property has its own color. Stones brilliant colors and various crystal formations developed when different mineral properties blended together along with the integrat of temperature and pressure.

The veins and color grains of marble were liquid minerals that flowed through the sto when the Earth heated up. The intense heat softened the limestone to allow the liquid to flow through it. When the Earth cooled, the mineral flow stopped and gradually hardened to its current state.

The delicate colors of stone can often be altered by the improper use of cleaning chemicals, mopping with dirty solution, using chemicals that are not designed for stone care, and sunlight can fade the color of natural minerals.

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Reflectivity of Stone:

Stone contains natural crystals. These crystals reflect light to provide a shine on the surface. When the crystals are dull, crushed, or broken, they cannot reflect light ever. For example, when the lens of a flashlight breaks, it cannot reflect the light that is being emitted from the bulb.

Polished stone floors become dull when heavy foot traffic along with sediment erodes the crystals. Normal footwear does not cause the main damage, sediment and grit do. The sediment and grit that lies on the stone surface is the main enemy of the stone's crystals. The damage to the crystals occurs when the pressure from the shoe forces the sediment to abrade or fracture the crystals.

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Hardness of Stone:

Marble is a relatively soft stone. On a measurement of hardness (MOHS), marble is approximately a three out of ten. Marble is made of calcium, just like your teeth. If you eat something too hard you will break your tooth. If you eat a lot of sugar you will get a cavity. Stone reacts the same way. If an improper chemical is applied to the surface, corrosion will begin to form cavities in the stone.

Listed below is the famous Measurement of Hardness (MOH) Scale for stone. This is a guide developed in the 1800's which helps evaluate the strengths and weaknesses of the stone being used. For example, softer stones would require the use of a less active chemical and a more frequent dust mopping program.

Measurement of Hardness Scale

1. Talc
2. Gypsum
3. Calcite (Most Marbles)
4. Fluorite
5. Apatite
6. Feldspar (Granite)
7. Quartz (Granite)
8. Topaz
9. Corundum
10. Diamond

The objective of the MOH Scale is to measure a stone's resistance to hardness. When sediment and grit are harder than the surface, they will scratch and harm the stone. For example, a piece of hard plastic is about a 2.0. It will not scratch #3 Calcite (Marble). However, a piece of sand that measures a 6, will scratch #3 Calcite but will not scratch #7 Quartz which is Granite. The harder the stone, the more resistant it is to abrasion. Exterior sediment that is tracked in to buildings approximately measures from 3.0 to 6.0.

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